(2021/2022)

Faculty of Pharmacy

Department of Pharmacognosy

Course Specifications

Plant Biotechnology (3276)

1- Basic Information:	
Program on which the course is given:	Bachelor of Pharmaceutical Sciences and Drug Technology
Mandatory or elective element of program:	Elective
Department offering the course:	Pharmacognosy
Academic year and level: 2021/2022 –Level:5	**Course prerequisite(s): Pharmacognosy 2 (3221)**
Date of specification approval:	6-10-2021
Title: Plant Biotechnology Code: 3276	**Theoretical: 2 hours (2 credit hours)** **Practical: 2 hours** (1 credit hour) Credit Hours: 3

Professional Information:

2- Overall Aim of Course:

The course aims that the pharmacist who is going to graduate should have acquired the competencies of integrating knowledge from basic and applied pharmaceutical sciences (1-1), Standardize pharmaceutical materials, formulate and manufacture pharmaceutical products (2-2), and express leadership, team working (4-1)

The course covers the advanced applications of plant tissue culture and plant biotechnology techniques in production of natural phyto-pharmaceuticals. It includes phyto-hormones, elicitors, explants and different culture media for increasing bioactive secondary metabolites. Manipulation of gene technology and biosynthesis for production of bioactive secondary metabolites.

3- Course Learning Outcomes:

N.B: Numbering system: first number stands for Domain; second number stands for Competency; third number stands for Key Element; fourth number stands for Program Learning Outcome.

1-1-Competency: Integrate knowledge from basic and applied pharmaceutical and clinical sciences to standardize materials, formulate and manufacture products, and deliver population and patient-centered care.

1-1-3- Integrate knowledge from fundamental sciences to handle, identify, extract, design, prepare, analyze, and assure quality of synthetic/natural pharmaceutical materials/products.

1-1-3-1 Recall knowledge for analysis and assuring quality of synthetic/natural pharmaceutical materials/products.

1. Recall applications of plant tissue culture and plant genetics utilized in ensuring the quality of final

biotechnological pharmaceutical product (1-1-3-1).

1-1-3-2-Integrate knowledge from fundamental sciences to handle, identify, extract, purify, standardize, synthetic/natural pharmaceutical materials/products.

2. Illustrate methods used in plant tissue culture and genetic engineering (1-1-3-2)

2-2 Competency: Standardize pharmaceutical materials, formulate and manufacture pharmaceutical products, and participate in systems for dispensing, storage, and distribution of medicines.

2-2-3 Recognize the principles of various tools and instruments, and select the proper techniques for synthesis and analysis of different materials and production of pharmaceuticals.

2-2-3-2 Select molecular biology techniques for production of pharmaceuticals and biopharmaceuticals.

3. Apply tissue culture and molecular biology techniques for production of pharmaceuticals (2.2.3.2)

2-3- Competency: Handle and dispose biologicals and synthetic/natural pharmaceutical materials/products effectively and safely with respect to relevant laws and legislations.

2-3-1 Handle, identify, and dispose, biologicals, synthetic/natural materials, biotechnology-based and radio-labeled products, and other materials/products used in pharmaceutical field.

2-3-1-1 Select the proper methods for handling, identification, and disposal of different materials including chemicals, glassware, pathological samples, biotechnology-based materials and radio-labeled products used in the pharmaceutical field.

4. Apply the proper methods for handling, preparation and disposal of different components constituting the tissue culture media or used in plant biotechnology. (2.3.1.1)

4-1 Competency: Express leadership, time management, critical thinking, problem solving, independent and team working, creativity and entrepreneurial skills.

4-1-2 Retrieve and critically analyze information, identify and solve problems, and work autonomously and effectively in a team.

4-1-2-3-Work autonomously and effectively in a team.

5. Work effectively in team (4.1.2.3).

4- Contents:

Week	Topic	No. of Teaching Hours	Lecture	Lab	Course Learning Outcomes
One	Introduction to plant tissue culture	**4**	**2**		**1**

	Lab rules and demo to plant tissue culture lab equipment			**2**	**3,4**
Two	Equipment used in plant tissue culture lab	**4**	**2**		**1, 2**
	Media preparation			**2**	**3,4**
Three	Plant tissue culture media components	**4**	**2**		**1, 2**
	Training on sterilization technique			**2**	**3,4**
Four	Callus and cell suspension culture	**4**	**2**		**1, 2**
	Sterile germination of seeds (1)			**2**	**3,4**
Five	Production of secondary metabolites in tissue culture	**4**	**2**		**1, 2**
	Sterile germination of seeds (2)			**2**	**3,4**
Six	Yield improvement strategies for production of secondary metabolites	**4**	**2**		**1, 2**
	Callus and cell suspension culture			**2**	**3,4**
Seven	**Midterm exam**				
Eight	Hairy root culture	**4**	**2**		**1, 2**
	Demo on PCR			**2**	**3,4**
Nine	Case study for production of secondary metabolites in plant tissue culture (1)	**4**	**2**		**1, 2**
	Demo on gel electrophoresis			**2**	**3,4**

	Ten	Case study for production of secondary metabolites in plant tissue culture (2)	**4**	**2**		**1, 2**
		Students presentation			**2**	**5**
	Eleven	Biosynthesis of bioactive secondary metabolites	**4**	**2**		**1, 2**
		Revision			**2**	
	Twelve	Manipulation of gene technology and biosynthesis for production of bioactive secondary metabolites	**4**	**2**		**1, 2**
		Practical exam			**2**	
	Thirteen	Recent updates	**2**	**2**		**1, 2**
	Fourteen	Revision	**2**	**2**		

5- Teaching and Learning Methods:

1. Online Lectures
2. Labs
3. Open discussion
4. Presentation

6- Teaching and Leaning Methods for Probation Students:

1. Online Lectures
2. Labs
3. Open discussion
4. Presentation
5. Extra tutorial

7-Student Assessment:

a- Assessment methods:	a. Class work: 1. Quizzes 2. Midterm theoretical 3. Practical exam 4. Assignments b. Final exam 1. Written theoretical 2. Oral

b- Assessment schedule:	a. Class work: 1. Quizzes: Quiz (4th ,11th week) 2. Midterm theoretical (7th week) 3. Assignments (all semester) 4. Practical exam (12th week) b. Final exam 1. Written theoretical (15th week) 2. Oral (15th week)
c- Weight of assessments:	a. Class work 50 marks (50%) distributed as: 1. Quizzes 10 marks (10%) 2. Midterm theoretical 10 marks (10%) 3. Attendance, Participation and assignments 10 marks (10%) 4. Practical exam 20 marks (20%) b. Final exam 50 marks (50%) 1. Written exam 40 marks (40%) 2. Oral exam 10 marks (10%) Total percentage 100 marks (100%)

8- List of References:

1. Course notes: uploaded on system (Portal)
   i. Lecture notes: Plant Biotechnology
   ii. Practical note: Plant Biotechnology Lab Manual
2. References

Essential books:

Verma V. Textbook of plant physiology, New Delhi : Ane books Pvt. Ltd. , 2007
Reference 2: Medicinal natural products : by Dewick, Paul M.
Publication: Hoboken : Wiley, 2008

Recommended books:

Plant Biotechnology and Genetics: Principles, Techniques, and Applications, 2nd Edition
C. Neal Stewart Jr. (Editor)
ISBN: 978-1-118-82012-4 March 2016

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i. Plant Biotechnology Journal, PCTOC Journal Of plant Biotechnology .

Web sites: Pubmed.com, Scirus.com ……etc

1- Facilities required for teaching and learning

1. Data show.
2. White Board.
3. Glass ware.
4. Chemicals.
5. Laboratories equipment (colorimeter, sensitive balances, digital water bath, automatic pipettes).

Instructor: Prof. Dr. Omar M. Sabry Omar M. Sabry

Department Head: Prof. Dr. Sameh AbouZid **Date: 6-10-2021**

Approved by QAC 2020/2021

Concerning NAQAAE Form No 12